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NEOM



AN AUDACIOUS LINE

Bringing an urban utopia to life

Neom is aiming to create a revolution in urban living, with a new concept of layered living in modular neighbourhoods – with all amenities within walking distance – that stretch across 170 km of The Line, writes *Bina Goveas*.

DESCRIBED by some as the most ambitious project the world has ever seen, Neom is expected to launch a revolution in urban living. The city in the remote northwest of Saudi Arabia is looking to enhance livability, tackle environmental challenges and deliver new urban standards through concepts that can best be described as revolutionary – even challenging the imagination.

Early last month, the *Saudi Press Agency (SPA)* announced that the kingdom has submitted an official bid to host the 2029 Asian Winter Games in Neom's Trojena, highlighting Saudi Arabia's confidence that the futuristic city – that needs to be built from scratch at an estimated cost that ranges from \$500 billion to \$1 trillion – would not only be completed but also well-gearred to host a world-class sporting event such as this.

The giga-project has been frequently in

the news of late: at the end of July, HRH Prince Mohammed bin Salman, Saudi Arabia's Crown Prince who is also Chairman of the Neom Board of Directors, unveiled the designs for The Line, which will be the heart of the mega city located in the Tabuk Province. These designs reveal just how ambitious and challenging the vision for Neom is: It involves constructing the world's largest structure, comprising two reflective glass – or mirror-clad – buildings standing 500-m tall, 200 m across and running parallel for 170 km across coastal,



The Line comprises two mirror-clad buildings that run parallel for 170 km.

Neom is leading a team of the brightest minds in architecture, engineering and construction to make the idea of building upwards a reality.

– HRH Prince Mohammed bin Salman, Saudi Arabia's Crown Prince who is also Chairman of the Neom Board of Directors



Trojena ... excavation work is reported to have started on a lake at the destination.

mountain and desert terrain.

The two buildings will be connected via walkways – a high-speed train will run beneath them. The Line also boasts concept designs such as integrated vertical farming, a marina for yachts, and a sports stadium built up to 305 m above ground – and all this come at a price tag of a whopping \$1 trillion, according to a report in *The Wall Street Journal (WSJ)*.

According to further details revealed last month, The Line will be made up of modular neighbourhoods stretching across all 170 km of Neom. Designed to make life easier, each will be home to 80,000 people with all services available within a five-minute walk. The Line will be home to nine million people, create 380,000 new jobs and run entirely on renewable energy.

The Line is one of the three key components of Neom that have been announced to date. The other two flagship projects include Oxagon, its reimagined manufacturing and innovation city; and Trojena, its global mountain tourism destination that will offer the Arabian Gulf's first outdoor skiing facility, which is bidding to host the region's first Asian Winter Games.

Built from the ground up as a living laboratory, Neom is expected to include hyperconnected, cognitive towns and cities,

ports and enterprise zones, research centres, sports and entertainment venues and tourist destinations.

The project demands complex engineering and construction expertise requiring the development of innovative technologies that will have to undergo stringent and intensive testing before being applied on site; it will require advanced materials that live up to the high sustainability and durability standards set for this ambitious project; and it will need a skilled workforce to put it all together as designed and engineered.

Can such a utopian paradise be created with our current know-how and expertise?

To implement the utopian paradise, the industry needs to up its game, implement the most innovative technologies and gather the brightest minds in architecture, engineering and construction.

TROJENA

Since the announcement of The Line more than a year ago, Neom unveiled plans for Oxagon, a reimagined industrial city, in November last year, which was followed by the launch of Trojena, a sustainable mountain tourism destination situated in the centre of the futuristic city in a region characterised by a mountain range with the highest peaks in Saudi Arabia at 2,600

m above sea level. Trojena is claimed to be a new year-round tourist destination that will comprise a ski village, ultra-luxury family and wellness resorts, sports activities including a ski slope, watersports and mountain biking, as well as an interactive nature reserve. The project is set for completion by 2026. Trojena is expected to attract 700,000 visitors and 7,000 permanent residents by 2030.

OXAGON

Oxagon, which represents a radical new model for future manufacturing centre, spreads over a large area in the southwest corner of Neom. Its core urban environment is centered around an integrated port and logistics hub.

The unique octagonal design minimises impact on the environment and provides optimal land usage, with the remainder left open to preserve 95 per cent of the natural environment, according to the developers.

A defining feature of the city is said to be the world's largest floating structure, which will become a centre for Neom's blue economy and achieve sustainable growth.

Oxagon will host the world's largest green hydrogen project being built by a tripartite venture; the world's largest and most advanced modular building con-

HUMAN-CENTRIC LINEAR CITY



A REVOLUTION in urban living, The Line is a 170-km belt of hyper-connected future communities, without cars and roads and built around nature, that aims to address the most pressing challenges facing humanity today such as legacy infrastructure, pollution, traffic, and human congestion, said Neom.

The city will run entirely on renewable energy and prioritise people's health and well-being over transportation, put nature ahead of development and will contribute to preserving 95 per cent of Neom's land.

The Line, which is only 200 m wide, 170 km long and 500 m above sea level, will eventually accommodate nine million residents.

This, in turn, will reduce the infrastructure footprint and create never-before-seen efficiencies in city functions, according to Neom. Residents will also have access to all facilities in The Line within a five-minute walk, in addition to a high-speed rail with an end-to-end transit of 20 minutes.

According to HRH Crown Prince Mohammed bin Salman, the designs for the city's vertically layered communities will challenge the traditional flat, horizontal cities and create a model for nature preservation and enhanced human livability.

"Neom is leading a team of the brightest minds in architecture, engineering and construction to make the idea of building upwards a reality," he said.

The idea of layering city functions vertically while giving people the possibility of moving seamlessly in three dimensions (up, down or across) to access them is a concept referred to as 'Zero Gravity Urbanism'. Different from just tall buildings, this concept layers public parks and pedestrian areas, schools, homes and places for work, so that one can move effortlessly to reach all daily needs within five minutes, according to Neom.

The outer mirror facade allows its small footprint to blend with nature.

To create the most convenient city in the world, city func-

tions will be layered for maximum livability and efficiency.

According to Neom, The Line is being built in such a way that its urban footprint will be just two per cent of a conventional city, occupying will total only 34 sq km, thus supporting the developer's goal of preserving 95 per cent of land for nature.

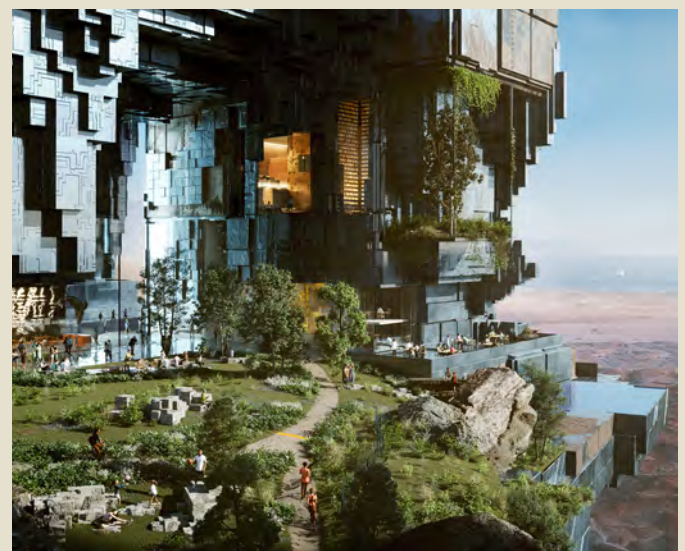
Inside the structure, to ensure the establishment of microclimatic spaces, the environment

has been carefully designed to allow for an optimal balance of sunlight, shade and natural ventilation, it stated. Furthermore, the green open spaces throughout the city will further enhance the comfort for those living, working and visiting here.

Neom's diverse terrain includes pristine beaches, red desert expanses and snow-capped mountains – with views of the Gulf of Aqaba. Due to The Line's impressive length, the city passes through each of these unique landscapes, offering a variety of adventures.

The city's design will be completely digitalised, and the construction industrialised to a large degree by significantly advancing construction technologies and manufacturing processes.

To spearhead its ambitions in the renewables and digitisation sphere, Neom has set up two subsidiaries: Enowa, its energy, water and hydrogen company, which was launched in March this year; and the Neom Tech & Digital Company. ■



The Line layers city functions vertically while giving people the possibility of moving seamlessly in three dimensions.

struction factory being set up with Gulf Modular International; and the largest hyper-scale data centre in the region, a joint venture between FAS Energy and Neom.

Acwa Power, a leader in power generation and water desalination plants, along with Air Products, a world leader in industrial gases, and Neom, are jointly developing what will be the largest green hydrogen production facility in the world, that will use over 4 GW of renewable energy capacity to generate the power used for producing green hydrogen. Coming onstream in 2025, the \$5-billion green hydrogen plant is likely to be the first of several similar plants that will make Neom a hub for green hydrogen production and innovation.

Meanwhile, the \$1-billion modular building construction factory project will come up on a 1.4-million-sq-m site and will be capable of producing up to 12,500 modular units per year, once fully operational.

INFRASTRUCTURE WORK

Work have already begun to provide the critical infrastructure for The Line, Oxagon and Trojena projects. Neom has awarded drill-and-blast tunnelling contracts for work on its infrastructure in what is considered one of the world's largest transportation and utility infrastructure projects. Two joint venture groups will undertake the project, which is separated by lower and upper geographies, with the first contract awarded to a joint venture of FCC Construction, China State Construction Engineering Corporation and Shihb Al-Jazira Contracting Company (FCC/CSCEC/SAJCO JV), and the second to a joint venture of Samsung

C&T Corporation, Hyundai Engineering and Construction Company and Saudi Archirodon Company (SHAJV).

The scope of works includes more than 28 km of tunnelling, providing separate tunnels for high-speed and freight rail services to facilitate faster, safer and easier movement of people and goods.

The rock excavated will be processed for subsequent reuse within the permanent concrete lining of the tunnels and other projects within Neom to ensure minimal impact to natural landscapes.

Excavation works are also reported to have commenced on a lake at Trojena.

Close to 50 contractors are reported to be currently on site at Neom. For instance, Keller, one of the world's largest geotechnical specialist contractors headquartered in Germany, is working a major piling contract for The Line.

The company has signed an umbrella framework agreement with respect to the project, and is mobilising for an anticipated first works order on a portion of Module 40 which has an expected value to Keller of around £50 million (\$61.3 million), with the work targeted to be completed within the next 12 months.

According to Keller, The Line is subdivided into approximately 135 modules, each containing eight buildings founded on large-diameter bored piles. Further works orders are expected to be awarded later in the year on subsequent modules, it stated.

Among other contractors, Italy-based foundation engineering specialist Trevi has signed a contract for the foundations of The Line, after completing all foundation pile tests to identify the best technological solution for the project.



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Among other deals concluded recently for work at the futuristic city, Enowa, the energy, water, and hydrogen subsidiary of Neom, has signed a memorandum of understanding (MoU) with Japanese trading company Itochu, and Veolia, a global leader in water, waste, and energy management solutions to develop a first-of-its-kind selective desalination plant powered by 100 per cent renewable energy in Oxagon.

Scheduled to produce its early-water in 2024, the new facility will be key to realising Enowa's ambitions to create a sustainable, abundant water supply for residential, industrial, and commercial use.

The new plant is expected to have production capacity of 500,000 cu m of desalinated water per day on completion in 2025 – approximately 30 per cent of Neom's forecasted total water demand. It will use a high-recovery reverse osmosis process utilising advanced and innovative membrane separation technologies to produce water, as well as concentrated brine streams. The brine streams will be used as feedstock to produce valuable minerals



A defining feature of Oxagon is what is claimed to be the world's largest floating structure.

and metals and achieve 100 per cent Zero Liquid Discharge in downstream brine industries fully developed by Enowa.

In line with its focus on the environment, Neom has embarked upon a greening initiative in collaboration with the National Center for Vegetation Cover and

Combating Desertification, which will see the return of 100 million native trees, shrubs and grasses by 2030. Its goal is to improve vegetation cover across its site by rehabilitating at least 1.5 million hectares of land, further contributing to the Saudi Green Initiative. ■

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Al Kifah's concrete puts city on firm footing



The first concrete pour for the project was carried out on March 3 this year.

AL Kifah Ready-Mix & Blocks (KRB), a leading provider of ready-mixed concrete and concrete masonry blocks products in Saudi Arabia, says it holds the distinction of having been the first supplier of concrete products for the staff accommodation at Neom, and continues to play a key role in the development of this futuristic city.

The company is this year supplying readymix concrete to Nesma and Partners, the main contractor involved in building more than 400 units for the staff accommodation on the top of Neom's Jabal Al Lawz at Trojena (Saudi Arabia), which will be the first outdoor ski resort in the region, according to the company.

KRB is supplying more than 4,000 cu m of environment-friendly concrete to support the construction of the Jabal Al Lawz staff housing project. The company has deployed Volucon Volumetric Mobile Batch Plants (VMBP) to produce high-quality

concrete that conforms to international standards and is characterised by being environmentally friendly in line with its sustainability goals, according to the volu-

metric project manager.

"The first concrete pour for the project was carried out on March 3 this year. For the project, KRB mobilised a specialised team that included a group of talented engineers specialised in concrete and operating equipment, a quality control (QC) manager, batch plant (VBP) inspector and QC lab technician," he adds.

At Neom, Al Kifah Ready Mix tackled the twin challenges of the weather and the mountainous terrain with its volumetric unit, which is "the perfect technical solution for concrete production in remote areas".

These units do not need foundations as there is no footprint; and being mobile, they reduce the need for truck movement. They produce ConGreen sustainable concrete, which allows for reduced cement content. This apart, they reduce the risk to aquatic life, pollution, and soil contamination.

"Concrete is produced by volumetric measurement and continuous mixing with full compliance to ASTM C685 and ACI 304 and is approved by specifying bodies such as Saudi Aramco," says the R&D manager at KRB.

VMBP is an innovative sustainable and eco-friendly technology for concrete production. Characterised by being compliant to sustainability standards, these batching plants provide a sustainable solution for concrete production in remote areas and tough topographies, requiring zero mobilisation time, he points out.

Citing other advantages of the batching



KRB is supplying more than 4,000 cu m of environment-friendly concrete to support the construction of the Jabal Al Lawz staff housing project.



KRB has an expert team engaged on the Neom project.

plants, he says: “They facilitate high productivity and accuracy with zero wastage and enable concrete production with minimal energy consumption. This apart, concrete is produced and poured onsite.

“These batching plants produce concrete of consistently high quality. Each unit can produce 20 cu per hour of concrete, which can be directly discharge or transferred into transit mixers for distribution. Aggregates can be stored on site or in multiple areas. Cement is normally supplied in a bulker with direct feed into the mixing unit, eliminating the need for silos.”

Innovative volumetric technology is used to better serve and help in giving solutions for clients based on their needs in remote and rough-terrain areas, in addition to all offshore works.

The R&D manager, point out that concrete is sustainable when it is produced in a low energy consumption facility, produced with little waste, made from some of the most plentiful resources on Earth; when it produces durable structures, is made with green materials and technologies with a very low carbon footprint, and made with recycled materials.

Al Kifah is a leading producer of sustainable concrete with a very low carbon footprint and low resource footprint. The company has a low energy consumption production line; utilises low carbon dioxide emission technology and materials and recycled and/or inhouse

or regionally sourced materials; and low carbon dioxide emission materials; and adopts waste control measures.

SAFETY

KRB HSE manager says KRB is fully committed to creating, providing and sustaining a safe working environment and promoting and maintaining the highest

health, safety and environment (HSE) as well as quality standards in its entire operations at the Neom project and thus contributing to the overall betterment of employees, communities and other stakeholders.

As a key player in the Neom project, KRB aims to operate in a safe manner and work towards an incident-free workplace which neither causes nor creates a risk of harm or injury to people and assets at the project.

In addition, KRB is constantly working on improving its processes to meet the requirements of international accreditation in the quality management system and customer satisfaction. It has been conferred with the internationally recognised ISO 9001:2015 certification for quality management

In-site testing facility has been established according to ASTM C1077 and it is well-equipped with all laboratory equipment needed to conduct performance tests of raw materials as per ASTM standards and to ensure that the green concrete produced by volumetric mobile batch plant is always compliant with the international standards ASTM C685 and ASTM C95 and meets the project specifications and the customer requirements, he concludes. ■



KRB has deployed Volucon Volumetric Mobile Batch Plants to produce high-quality concrete that conforms to international standards.

Mercedes-Benz trucks facilitate work at Neom



JUFFALI Commercial Vehicles is playing a vital role in the construction and development of Neom – one of the world's most ambitious new mega-developments – through the supply of a fleet of the new generation of Mercedes-Benz Actros and Arocs heavy-duty trucks.

Neom is described as a vision of what a new future may look like. The estimated \$500-billion development in northwest Saudi Arabia on the Red Sea is being built from the ground up as a living laboratory, and a place where entrepreneurship will chart the course for this new future, says a spokesman for the Saudi-based company.

For the massive development, which will be “a destination and a home for people who dream big and want to be part of building a new model for exceptional livability, creating thriving businesses, and re-inventing environmental conservation”, Juffali Commercial Vehicles is providing the new generation of Mercedes-Benz trucks, which have been assembled at a factory of its subsidiary.

The Actros and Arocs trucks, which are assembled at the factory of National Automobile Industry (NAI), add a new dimension of efficiency and strength, as they have been developed specifically for the extreme climatic conditions in Saudi Arabia and with specifications that enable them to

withstand the most difficult operating requirements, says a senior official of Juffali Commercial Vehicles.

Heiko Schulze, CEO of Juffali Commercial Vehicles, said: “The Mercedes-Benz Trucks brand is synonymous with reliability, comprising top-of-the-range heavy-duty trucks; our customers receive a truck with components that are designed to work together to deliver higher production levels and versatility.

“The Mercedes-Benz Actros and Arocs trucks have proven to be highly efficient and durable, making them a favourite for many customers around the world.”

“The scale and ambitions of Neom are second to none and it is incredibly rewarding to see that our Mercedes-Benz Trucks Actros and Arocs are working so hard for



Neom ... a \$500-billion development.

this world-class project,” he adds.

The Actros impresses with its practical design, robustness and safety. It is equipped with leading Mercedes-Benz vehicle technology and components tested under the toughest conditions, according to a spokesman for Juffali Commercial Vehicles. A three-year or 450,000-km powertrain warranty comes as standard with the truck. The engines of the Actros are designed for low optimised fuel consumption, maximum longevity and optimal performance.

The Actros meets the continually growing demands in long-distance and heavy-duty distribution haulage more effectively and efficiency than ever, says the spokesman.



Schulze ... the brand is synonymous with reliability.

Meanwhile, the road and all-wheel-drive variants of the Arocs offer particularly tough and robust vehicles to meet any challenge in construction and off-road transportation – from platform vehicle and concrete mixer to heavy-duty tipper. The truck is said to powerfully master every driving situation, equipped with a robust and high-torque engine, Mercedes PowerShift 3 and a new unique suspension and frame design, all as standard.

The Arocs was built with an increased ground clearance with high angles of approach to ensure optimised agility even in challenging road conditions. A durable powertrain delivers precisely the power needed in off-road transportation, construction sites or extreme terrain.

These trucks are eminently suitable for the various applications in the extreme climatic conditions and rough terrain of Neom, where the first phase of the development is expected to be complete by 2025. ■